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SWITCH ARRANGEMENT, PARTICULARLY FOR USE
IN ELECTRO-THERAPEUTIC TREATMENTS
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2,290,688

2 Sheets-Sheet 2

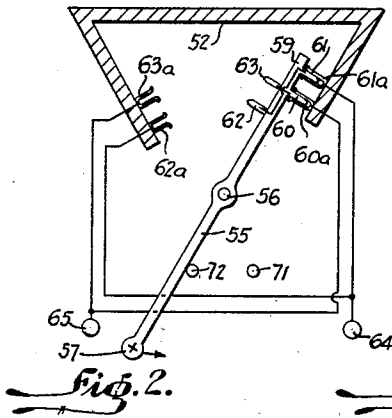


Fig. 2.

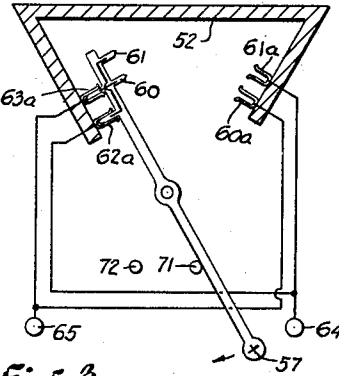


Fig. 3.

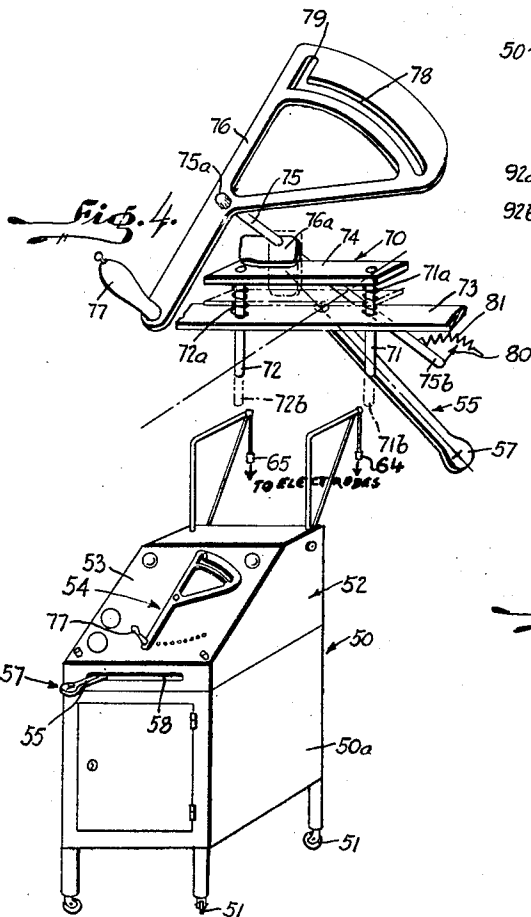


Fig. 4.

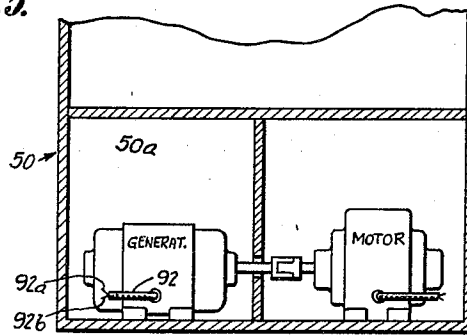


Fig. 6.

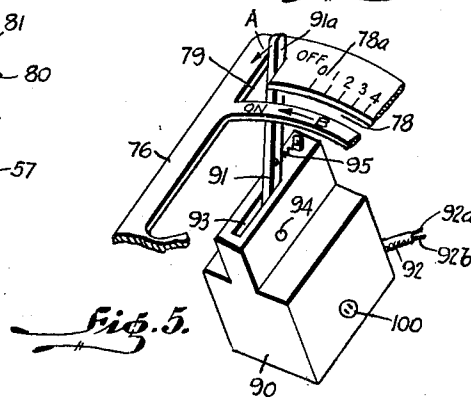


Fig. 5.

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2,290,688

SWITCH ARRANGEMENT, PARTICULARLY
FOR USE IN ELECTROTHERAPEUTIC
TREATMENTS

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15 Claims. (Cl. 171-97)

This invention relates in general to electro-galvanic baths or electro-therapeutic treatment plants and more particularly to a switching or controlling arrangement for such treatment plants or baths.

It is an object of the present invention to provide a switching or controlling arrangement or switch board having means for operating one or more pairs of electrodes in electro-therapeutic treatments.

It is another object of the present invention to provide a switching arrangement for connecting one pair of electrodes to a current source and another pair of electrodes employed in the same plant to a current source which is similar to or different from that of the aforementioned kind.

Still a further object of the present invention is to provide a polarity changing means included in the aforesaid switch board whereby the direction of current to and from the electrodes may be altered during treatment of a patient and without any injurious effect to him.

Yet another object of the present invention resides in the provision of means whereby the current intensity may be first set to zero before the aforesaid polarity changing means can be operated.

Still another object of the present invention is to provide a current source having different tapping points whereby to selectively produce different wattage values between different pairs of electrodes.

A further object of the present invention is to provide an electrical system, particularly but not exclusively employable in conjunction with therapeutic baths by which the electrical treatment may be quantitatively, qualitatively or directionally controlled or regulated in order to provide a substantial local treatment of a human body part while the remaining part of said body is subjected to the influence of an electrical charge which may differ from that applied locally.

A still further object of the present invention is to provide means for controlling (by switching on and off) the main switch for the circuit of the electrodes dependent on the positioning of the rheostat regulating the current intensity to said electrodes.

Accordingly, the invention consists in the features of construction, combination of elements and arrangements of parts, all as will be illustratively set forth in the following description, and the scope of the application of which will be indicated in the appended claims.

With these and other objects in view, there have been illustrated on the accompanying drawings forms in which the invention may be conveniently embodied in practice.

In the drawings:

Fig. 1 diagrammatically represents a control or switching system employable in the invention.

Fig. 1a is a diagrammatic view of the panel board on which the means are mounted for actuating the system shown in Fig. 1.

Figs. 2 and 3 show partly in section and diagrammatically two different positions of pole changing means used in connection with the invention, said means forming part of an apparatus shown in Fig. 7.

Fig. 4 is a perspective view of the pole changing and controlling means built in the apparatus of Fig. 7.

Fig. 5 shows in perspective (parts being broken away) switch means employable in the invention.

Fig. 6 shows the generator and driving means housed in lower portion (shown in section) of the apparatus of Fig. 7.

Fig. 7 is a perspective view of a rollable control and switching apparatus including polarity changing means for the electrodes employed in therapeutic baths.

Referring now to Figs. 1 and 1a, there is disclosed a system and its actuating means, for controlling the fed current to, say, two pairs of electrodes placed within a medicinal bath.

The wiring system therefor is clearly shown in Fig. 1 and the panel board in Fig. 1a. There may be provided two different sources of electric power derived respectively from battery 10 having terminals 10a, 10b, 10c; 10b being a middle tap. In the drawing, the voltage of battery 10 between terminal 10b and 10c is indicated as being 22.5 volts and between 10a and 10c as being 45 volts. These terminals, respectively lead to switches 11, 12, 13 and 14 of panel board 15 so that either 22.5 volts or 45 volts may be drawn from battery 10 as desired. The battery current may be controlled by main switch 17.

The other power source may derive from the main power line 16 the A. C.-current of which is passed through a rectifier and if desired through a filter system (both not shown, but well known in the art) and leads to the off-on switch 17 and to terminals on switches 14 and 13, as clearly seen in Fig. 1. Rheostats I and II are employed to finely control the current intensity desired for the respective pairs of electrodes.

For each pairs of electrodes, there is provided

a polarity changer 18 and 19, the said polarity changers being of different types, in this particular instance. In the case of polarity changer 18, in order to change the polarity, the current control switches 17, and 12 or 13 (as the case may be) has first to be turned off and set to zero (rheostat II) before the polarity switch 13 is operated. In the case of polarity changer 19 provision is made to avoid the switching off of the current and to set the current switches 14 or 11 to zero (rheostat I). To this end, polarity changer 19 contains resistances 20, 21 which decrease the current intensity to a minimum to permit change of polarity at the electrodes (not shown) without shocking the patient within the bath.

Instrument 22 controls the pulsations from the power line 16. Ammeters 23, 24 are employed in the circuits shown in Fig. 1 to indicate the respective currents in "milliamperes," while instrument 25 indicates the wattage consumed by either pair of electrodes, separate switches 26, 27 are provided to momentarily cut in the respective pair of electrodes. Low voltage control lamp 28 is connected to the circuit to indicate whether the power coming from the rectifier is turned on or off.

In order to operate switch board 15, first assuming that pair of electrodes 40 is to be charged with current coming from the power line 16 and pair of electrodes 41 is to be switched on battery of 22.5 voltage, the following manipulations on the switch board 15 are made:

Switch 14 is thrown to power and switch 13 is thrown to battery side. Switch 12 is connected to terminals leading to 22.5 voltage of the battery 10 and finally switch 17 is turned to on-position. Rheostats I and II, respectively, regulate the respective desired values of current intensity at the pairs of electrodes 40 and 41. In order to change the polarity for said electrodes the aforesaid polarity changers 20 and 21 are operated in a manner as above described.

It is well understood that to change over to battery supply, pair of electrodes 40 are switched on in the following manner: Switch 17 is first turned off and switch 14 is thrown to the battery side and switch 11 is thrown to connect with any of the terminals of switch 11 carrying 22.5 voltage; and finally switch 17 is then turned to "on"-position and rheostat I may be operated to finely regulate the current intensity for the pair of electrodes 40.

Thus, it may easily be realized that the two pairs of electrodes may be respectively employed to charge the medium or medical bath liquid with electrical current from different supply sources and to be applied in particular to a local part of the human body by one pair of the electrodes while the entire body of the patient is subjected to an electrically charged bath by the other pair of electrodes, which may be positioned, for example, at the ends of the bath tub.

It is obvious, that the above outlined switching and controlling arrangement may be used in other electrical systems and devices.

It will be further apparent from the above that it is possible to employ as a common supply source, for instance the power line coming from the rectifier and controlling one pair of electrodes, say, 40 by rheostat I and the other pair of electrodes 41 by rheostat II, whereby different wattage values may be obtained at the respective pairs of electrodes. It is to be noted that the rectifier unit and the battery above referred to

can be housed in separate casings and removably set in into a receptacle having the switch board or panel 15 (shown in Fig. 1a). In that event, if desired, it will be possible to withdraw the rectifier unit from the receptacle and to place it near the main power line, whereas the controlling apparatus containing the battery and the connections to the rectifier can be placed adjacent the bath tub so that only low voltage current may be employed in the bath room. Instead of the rectifier a further battery may be placed in said receptacle so that the electrodes may have two different battery supply sources. As seen from Fig. 1a the polarity changers 18, 19 have more than two output channels, it being possible to thus connect to one pair of electrodes, say 41, at least a further electrode in parallel with the plus- or minus-electrode of said pair of electrodes.

Another embodiment of the invention as employed for operation of one pair of electrodes is disclosed in Fig. 7 and in greater detail in Figs. 2 to 5.

The control apparatus 50 which may contain a motor-generator arrangement (Fig. 6) in its lower part 50a is provided at its legs with castors 51 in order to facilitate displacement of the apparatus. The upper part 52 of the apparatus consists of a housing closed by a switchboard or panel 53 on which is mounted polarity changer 54 and which may carry other controlling means (not shown), for example, such as hereinbefore mentioned with reference to Figs. 1 and 1a.

The polarity changer may be of the portable type, such as referred to in my U. S. Pat. No. 2,240,504 or may be set into panel 53 and actuated in a manner about to be described. When it becomes necessary to change the polarity at the bath electrodes during treatment of the patient and while the same is subjected within the bath to a predetermined current intensity (A. C. or D. C.), it would be harmful and injurious to the patient to change the polarity of the electrodes without first setting back the current intensity to zero. In order to positively effectuate such switch manipulation the following instrumentalities may be provided.

Polarity changer 54 consists of a lever 55 which is swingably mounted on shaft 56 the latter upwardly extending within upper housing 52. Lever 55 projects with its forward end 57 through slot 58 (Fig. 7) and carries at its rearward end 59 at either side thereof a pair of contact fingers 60, 61 and 62, 63 for respective engagement with contact blades 60a, 61a and 62a, 63a. Contact blades 60a and 63a are both connected to one pole of a current source (such as shown in Fig. 6), whereas contact blades 61a and 62a are jointed to the other pole of said source. It will thus be apparent that, when swinging lever 55 into either of its extreme positions, as indicated by Fig. 2 and Fig. 3, respectively, a polarity change will be had with respect to the electrodes (not shown), the latter being for example, connected to terminals 64, 65, respectively.

In order to positively regulate and control the change of polarity, provision must be made to release lever 55 from its locking means 70 so that the lever 55 may accomplish its swinging movement from one to another of its extreme positions (Figs. 2, 3). The locking means 70 comprises two retaining members or fingers 71 and 72 which project through a traverse 73 fixed within apparatus housing 52. Above traverse 73 is movably positioned a panel 74 which is sup-

ported by springs 71a, 72a surrounding the fingers 71 and 72 and extending between traverse 73 and panel 74. Mounted on shaft 75 at 75a and for rotation therewith is segmental lever 76 having at one of its ends handle 77 and adjacent its other end a slot 78 of a shape as clearly disclosed in Figs. 7 and 4. Slot 78 has an extension 79 which is angularly directed with respect to slot 78 for a purpose hereinafter described. Shaft 75 fixedly carries at its end 75b a contact finger 80 which engages with rheostat 81. It will thus be realized that upon rotation of shaft 75 (which is suitably held in bearings of housing 52, not shown) by means of handle 77 of lever 76, finger 80 will actuate rheostat 81 which is connected to the power source (Fig. 6) through socket 100 (Fig. 5). Thus, the intensity of current with which the electrodes may be charged, can be regulated according to scale division 78a (Fig. 5) provided on segment part of lever 76. In order to cut into circuit the said current supply or power source, a switch box 90 is provided within housing 52 which box comprises a contact lever 91 for closing and opening the circuit for the electrodes to which current may be supplied through wires 92a and 93b of cable 92, and through socket 100, rheostat 80, 81 and terminals 64, 65. Lever 91 projects from within switch box 90 through slot 93 and is pivoted on stud 94 traversing box 90. Lever 91 is normally held in its off-position (shown in Fig. 5) by a spring 95.

The operation of the polarity changer in connection with the current switch arrangement hereinabove set forth is as follows: As soon as lever 55 has assumed one of its extreme positions (Fig. 2 or Fig. 3), lever 91 may be moved against tension of spring 95 in the direction of arrow A from its off-, to its on-position within slot 79 whereafter lever 76 may be rotatably moved by handle 77 together with shaft 75 whereby the desired intensity of current may be regulated as explained above; lever end 91a which forms an indicator relatively to scale division 78a being then retained in on-position through slot 78 of lever 76 which may be moved in the direction of arrow B (Fig. 5). Upon rotative movement of lever 76 together with shaft 75 a cam or follower 76a fixed to the latter engages with panel 74 and presses the same against tension of springs 71a and 72a downwardly into a position, illustrated in dot-dash lines so that pins or finger 71, 72 assume, respectively locking positions, indicated by numerals 71b and 72b, thus effectively preventing lever 55 from being operated or swung from its extreme position, either shown in Fig. 2 or 3.

While lever 76 has been moved back to zero (against direction of arrow B) and lever 91 has entered slot 79 thus automatically switching-off the current supply, pins 71 and 72 will be withdrawn from their locking positions (71b and 72b), thus permitting again operation of lever 55 for causing change of polarity at terminals 64 and 65 and at their respective electrodes (not shown).

It will thus be seen that there has been provided by this invention an apparatus for switching or controlling electro-therapeutic treatment plants, which comprises a switch panel including switch means and means for regulating electric current, a medium for conducting electric current, a plurality of terminals placed in electrical contact with said medium, and electric current supply means including a plurality of circuits connected to said terminals and regulating means, respectively, said regulating means for

controlling said circuits to said terminals, respectively, when the latter are cut into their respective circuits upon operation of said switch means, whereby electric currents of different values may be conducted to said respective terminals and simultaneously imparted thereby to said medium.

As many possible embodiments may be made of the above invention, and as many changes might be made in the embodiment above set forth, it is to be understood that all matters hereinbefore set forth or shown in the accompanying drawings are to be interpreted as illustrative and not in a limiting sense.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent, is:

1. An apparatus of the character described, comprising a switch panel including switch means and means for regulating electric current, a medium for conducting electric current, a plurality of terminals placed in electrical contact with said medium, and electric current supply means including a plurality of circuits connected to said terminals and regulating means, respectively, said regulating means for controlling said circuits to said terminals, respectively, when the latter are cut into their respective circuits upon operation of said switch means, whereby electric currents of different values may be conducted to said respective terminals and simultaneously imparted thereby to said medium.

2. An apparatus of the character described, comprising a switch panel including switch means and means for regulating electric current, a liquid medium for conducting electric current, a plurality of pairs of terminals placed in said liquid medium, and electric current supply means including a plurality of circuits connected to said pairs of terminals and regulating means, respectively, said regulating means for controlling said circuits to said pairs of terminals, respectively, when the latter are cut into their respective circuits upon operation of said switch means, whereby electric current of different values may be conducted through said respective pairs of terminals simultaneously to said liquid medium.

3. An apparatus of the character described, comprising a switchboard including switch means, means for regulating electric current and a plurality of output channels, a liquid medium for conducting electric current, a plurality of terminals placed in said liquid medium, and electric current supply means including a plurality of circuits connected to said terminals and output channels, respectively, said regulating means being joined to and adapted to control said circuits of said terminals, respectively, when the latter are cut into their respective circuits upon operation of said switch means, whereby electric currents of different values may be caused to flow simultaneously between said respective terminals within said liquid medium.

4. An apparatus of the character described, comprising a switchboard, a liquid for conducting electric current therethrough, a plurality of terminals placed in said liquid, a plurality of electric current sources including respective circuits connected to said terminals, means to quantitatively regulate the electric currents to said terminals, means to qualitatively control said electric currents to said terminals, and means to change the polarity of said terminals, all said means being connected to said switchboard, whereby upon operation of said means, respec-

tively, electric current may flow between respective terminals through said liquid in predetermined directions and with different wattage values, selectively.

5. In an electro-therapeutic plant, having at least two pairs of electrodes; electric current supply means including electric circuits for said electrodes, and a switchboard including controlling means connectable to said circuits of said current supply means, one of said controlling means being adapted to cut one pair of said electrodes into one of the circuits from one of said supply means, another of said controlling means being adapted to switch on another pair of electrodes to another of said supply means, both said supply means differing in wattage from one another.

6. An apparatus, particularly for use in connection with electro-therapeutic treatments and having a plurality of electrodes; comprising a switchboard including regulating means, a plurality of sources for electric current supply including electric circuits connected to said regulating means, respectively, and output channels disposed at said switchboard and controllable by said regulating means, said electrodes being removably connectable with said output channels, whereby the respective electrical outputs at said electrodes may be selectively adjusted with respect to each other.

7. An apparatus according to claim 6, wherein means are included for changing polarity between each pair of electrodes.

8. An apparatus according to claim 6, wherein one of said sources for electric current supply is constituted by A.C. power line including a rectifier unit, whereas the other of said sources for electric current supply is formed by a battery.

9. An apparatus according to claim 6, wherein the sources for electric current supply are different from each other and are separately regulatable by said regulating means.

10. An apparatus according to claim 6, including polarity changing means, and locking means cooperable with said polarity changing means, whereby operation of said polarity changing means may be effected upon release of said locking means.

11. In an apparatus of the character described including a medium adapted to conduct electric current therethrough and a plurality of electrodes placed in electrical contact with said medium; at least two electric current supply sources, and a switchboard provided with switch means, with electric current regulating means and with a plurality of output channels; said channels being connectable through said switch means to said electric current supply sources, respectively, and being arranged to removably receive wire connections to said electrodes, said switch means

being provided with pairs of contacts connected, respectively, to said electric current sources, whereby upon operation of said switch means electric current flow may be selectively switched in from either of said electric current sources to electrodes connected to said output channels and may be adjusted by said regulating means.

12. In an apparatus of the character described including a liquid bath adapted to conduct electric current therethrough and a plurality of electrodes placed in electrical contact with said bath; at least two separate electric current supply sources, and a switchboard provided with switch means including polarity changing means, with electric current regulating means and with a plurality of output channels; said channels being connectable through said switch means to said electric current supply sources, respectively, and being arranged to removably receive wire connections to said electrodes, said switch means being provided with pairs of contacts connected, respectively, to said electric current sources, whereby upon operation of said switch means electric current flow may be selectively switched in from either of said electric current sources to electrodes connected to said output channels and may be adjusted by said regulating means and said polarity changing means.

13. In an apparatus of the character described including a liquid bath adapted to conduct electric current therethrough and a plurality of electrodes placed in said bath; at least two different electric current supply sources, one of said sources being an A.C. line including a rectifier the other of said sources being a battery, a switchboard provided with a plurality of switch means, with means for regulating the intensity of electric current and with a plurality of output channels; said channels being connectable selectively by said switch means to said electric current supply sources, respectively, and being adapted for connection with predetermined electrodes, each of said switch means being provided with pairs of contacts connected, respectively, to said electric current sources, whereby upon operation of said switch means electric current flow may be caused at will from said electric current sources to said predetermined electrodes and adjusted by said regulating means.

14. An apparatus of the character described according to claim 13, including a casing for housing said rectifier and said battery, said switchboard being disposed at said casing.

15. An apparatus of the character described according to claim 13, wherein said electric current supply sources are separately regulatable by said regulating means.

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